9. Energy Efficiency and Conservation

Energy efficiency has been widely recognized as the most cost effective way to increase the reliability, safety, and security of our energy infrastructure. Lowering demand is the cheapest way to avoid congestion problems, maintain stable prices, and minimize the environmental impacts of our energy use. It has been estimated that "as much as 40-50% of the nation's anticipated load growth over the next two decades could be displaced through energy efficiency, pricing reforms, and load management programs."[1] As a result, states around the country are investing in policies and programs to realize the energy, economic, and environmental benefits of energy efficiency.[2]

9.1 Role of Energy Efficiency in New Hampshire

New Hampshire, like most other states that have restructured its electric industry, has recognized the value of energy efficiency and the role that it should play in a restructured marketplace. In RSA 374-F, the electric restructuring statute, the Legislature highlighted the important role that energy efficiency programs can play in a competitive electric market:

> Restructuring should be designed to reduce market barriers to investments in energy efficiency and provide incentives for appropriate demand-side management and not reduce cost-effective customer conservation. Utility sponsored energy efficiency programs should target cost-effective opportunities that may otherwise be lost to market barriers.
>
> RSA 374-F, Electric Industry Restructuring Act

In response to the passage of RSA 374-F, the Public Utilities Commission issued a Restructuring Plan for the state on February 28, 1997.[3] In the Plan, the Commission planned to phase out existing energy efficiency programs offered by electric utilities and funded by ratepayers two years after the implementation of retail choice. In response to motions for rehearing, reconsideration and clarification, the

[1]Richard Cowart, Regulatory Assistance Project, "Efficient Reliability: The Critical Role of Demand-Side Resources in Power Systems and Markets," prepared for the National Association of Regulatory Utility Commissioners, June 2001, p. 24.

[2] See www.aceee.org/briefs/mktabl for a listing of state efficiency programs.

[3] All Orders, Plans and Reports referenced in this section are available on the PUC website at www.puc.state.nh.us.

Commission issued Order No. 22,875 on March 20, 1998, which affirmed in part and vacated in part its position with respect to utility sponsored efficiency programs. In the Order, the Commission recognized that efficiency programs may be appropriate beyond two years after restructuring to be concurrent with transition service, stating:

> the transition to market based programs may take longer than the two year period we mandated in the Plan, though we continue to believe that such a transition period is an appropriate policy objective. We also recognized that there may be a place for utility sponsored energy efficiency programs beyond the transition period, but these programs should be limited to 'cost-effective opportunities that may otherwise be lost due to market barriers.' We believe that efforts during the transition toward market-based DSM programs should focus on creating an environment for energy efficiency programs and services that will survive without subsidies in the future.
>
> Order No. 22,875

The Commission's Order directed interested parties to form a working group to explore several issues regarding ratepayer-funded efficiency programs, including:

- Standards for evaluating programs;
- How best to measure cost-effectiveness of programs;
- What market barriers exist;
- Market transformation initiatives;
- Appropriate funding levels for low-income efficiency programs;
- Cost recovery mechanisms for the programs;
- Impacts on rates; and
- The contribution to these programs by large commercial and industrial customer who may no longer receive transition service.

The Energy Efficiency Working Group (EEWG) included representatives of electric and gas utilities, state agencies, environmental groups, consumers, and energy service providers. It held its first meeting in May of 1998, and continued to meet for the next year in facilitated meetings. In July of 1999, the EEWG filed its final report with the Commission,[4] and a hearing on the Report was held in September of that year. The Report, which represented the consensus of the diverse stakeholders, contained recommendations on the following issues:

[4] Report to the New Hampshire Public Utilities Commission on Ratepayer-Funded Energy Efficiency Issues in New Hampshire, July 6, 1999, http://www.puc.state.nh.us/eewkgrp/eewgpg.htm.

- Cost-effectiveness test with an environmental "adder;"
- Recommendation for an energy efficiency committee to develop statewide programs;
- Funding of efficiency programs;
- Adoption of a shareholder incentive rather than lost fixed cost recovery;
- Frameworks for assessing the eligibility of technologies or programs for funding;
- Program design; and
- Low income efficiency programs.

On November 1, 2000, the Commission issued an Order adopting portions of the recommendations in the Report, and setting forth guidelines for statewide energy efficiency programs to be designed, implemented, and administered by the state's electric utilities.[5] The Commission rejected a recommendation to create a stakeholder efficiency committee to assist utilities with the programs, and instead required the utilities to work together to create a set of "core" statewide programs available to all customers.

On October 31, 2000, the Commission issued a companion Order setting forth the allocation of the System Benefits Charge that funds both the energy efficiency and the low income bill assistance programs that are administered by the state's electric distribution companies.

9.2 Current Energy Efficiency Programs in New Hampshire

Electric Energy Efficiency Programs

As a result of the process described above, since June 1, 2002 New Hampshire electric utility customers can take advantage of new statewide energy efficiency products and services. These "core" energy efficiency programs were established consistent with Public Utilities Commission (PUC) Order 23,574, Order 23,850, and Order 23,982 which require the utilities to develop a consistent set of innovative, statewide core programs available to all New Hampshire ratepayers. The core programs will increase the availability of cost-effective energy efficient measures and services, while providing economic and environmental benefits to the State.[6]

The PUC also approved a unique pilot program for two electric utilities called "Pay-As-You-Save™" or "*PAYS*.™"[7] *PAYS*™ is designed to be a market-based system that allows consumers to purchase energy efficiency products for their homes, businesses and institutions. *PAYS*™ is designed to

[5] Order No. 23,574. See Docket DE 01-080 at www.puc.state.nh.us.
[6] More information on the core efficiency programs is available at www.nhsaves.com.
[7] The PAYS concept is a trademark of the Energy Efficiency Institute of Colchester, VT.

operate without the use of subsidies to enable consumers to buy products they would not otherwise purchase. However, the NH pilot program does utilize funds from the system benefits charge to fund the program over the pilot period.

In *PAYS*™, a customer pays for efficient products through payments on their electric bill. The payments are designed to be lower than the estimated savings from the measure, and the costs for the infrastructure, financing, and marketing are included in the price of the product.

PAYS™ is intended to eliminate the market barriers that currently inhibit consumers from purchasing energy saving products. *PAYS*™ requires no up-front payment, capital, or debt from the customer. *PAYS*™ measures "stay with the meter," and as a result there is also no need for customers to know that they will remain in a location for any period of time, or even for the potential purchaser to own the premises in which the *PAYS*™ product will be installed. The NH *PAYS*™ pilot will run through the end of 2003.

Natural Gas Energy Efficiency

Providers of natural gas, working with the Governor's Office of Energy & Community Services and other stakeholders, are finalizing programs to improve energy efficiency for residential, commercial and industrial natural gas users. The New Hampshire Public Utilities Commission is considering a proposal containing recommendations to offer a variety of programs including energy audits, incentive rebates for the installation of energy efficient products and technologies, and training programs.[8] The goal of these programs is to encourage the most efficient use of natural gas, and to help reduce market barriers so that energy efficient products and practices become the industry standard.

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[8] See Docket DG 02-106 at the Public Utilities Commission website, www.puc.state.nh.us.

9.3 Results of Energy Efficiency Policy Simulations

9.3.1 Impacts of Maintaining or Increasing Efficiency Funding

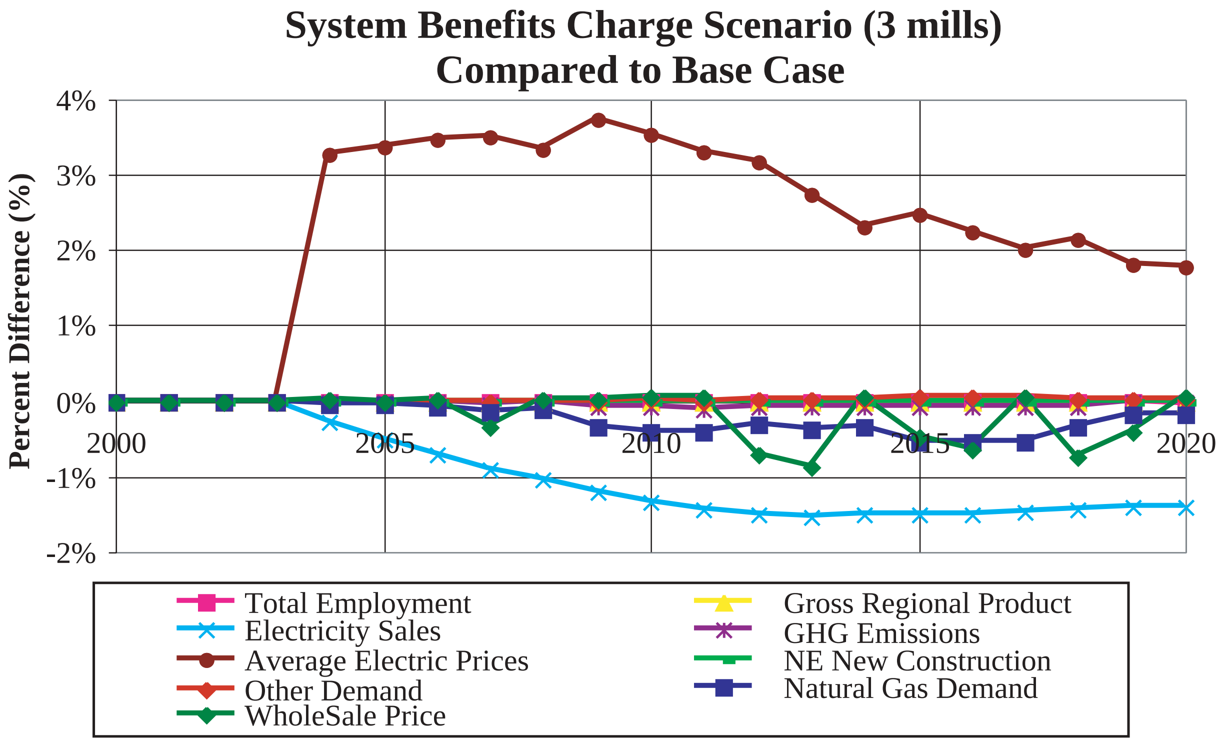

Figure 9.1 Impacts of 3 mill SBC Relative to Base Case

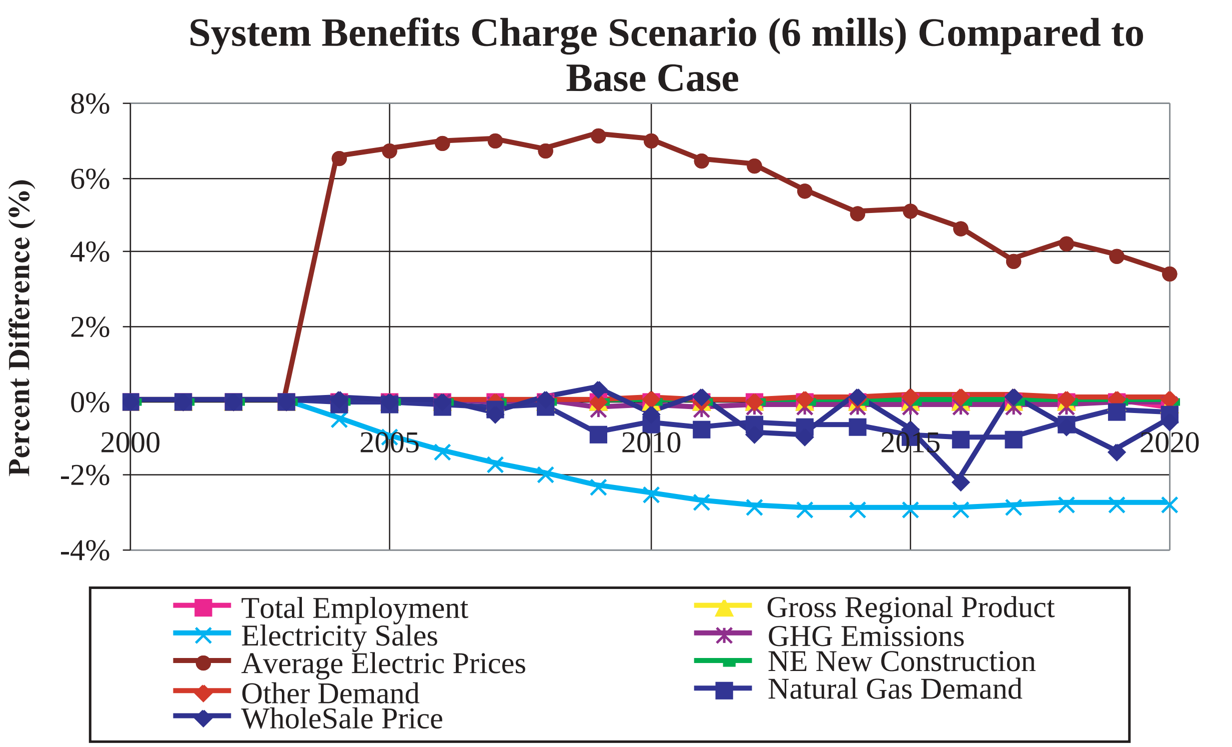

Figure 9.2. Impacts of 6 mill SBC Relative to Base Case

For many reasons, it is useful to study the economic and energy impacts of a modest rise in the cost of electricity, whether from higher fuel prices, transmission and distribution costs, or other price changes. The results of such a simulation provide insight into the impacts of changes in electricity prices in general, and also can inform deliberations of policy makers who consider using a system benefits charge (SBC) or similar mechanism for raising revenues that are then utilized to provide benefits to all ratepayers in the state. The figures below show the impacts of a system benefits charge, but the many important benefits from the investment of those funds from energy efficiency, renewable energy, or other programs are not captured.

The energy and economic systems are highly "nonlinear" – that is, there are feedback loops in the system so that the response to a doubling of investments in energy efficiency may not be double overall efficiency. For example, when electricity costs rise, consumers use less electricity over time by investing in higher efficiency devices, and in some cases even switching to cheaper fuels. As the demand for electricity decreases, this takes higher price generation off line, which in turn reduces the price of electricity.

Another example is when technology (such as high-efficiency light bulbs) makes it more affordable for customers to receive an energy service (such as lighting), they may decide to purchase more of that service. As a third example, when output from a regional economy is increased, this tightens the regional labor market, which raises wages, which in turn reduces the profitability in the region's businesses and partially compensates, over time, for the original increase in output. Because of the possible influence of such non-linearities and feedbacks in the energy and economic systems, in order to characterize the system responses and the magnitude of these responses, we tested the impacts of two levels of SBC: 3 mills and 6 mills (a mill is a surcharge of one-tenth of a cent per kWh).

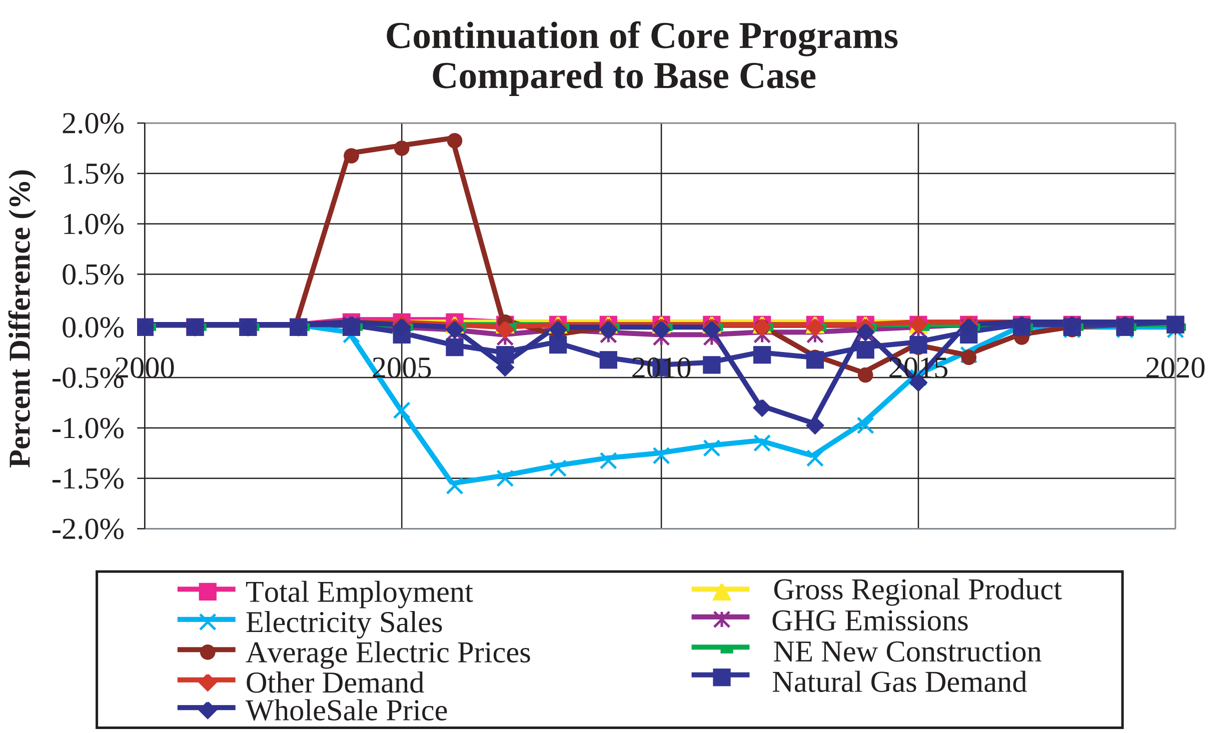

Figure 9.3. Smaller Percentage Impacts of Core Program Extension

The responses for a number of variables relative to the Base Case are shown in Figures 9.1 and 9.2. In these figures we see that electricity sales drop by 1.5% after 10 years for a 3 mill SBC, and by roughly twice that (just under 3%) after 10 years for a 6 mill SBC. The wholesale price paid for electricity is reduced by nearly 1% for some of the years in the 3 mill case, and by 1-2% in some years of the 6 mill case. Natural gas demand is reduced slightly due to the reductions in electricity generation. As the figures indicate, in percentage terms the economic impacts are close to zero, as compared with the impacts on electricity price and electricity.

The economic impacts are also shown in Tables 9.1 and 9.2, where we can also see some evidence of non-linearity in economic response to the SBC levels. For example, the 3 mill SBC would lead to an average loss of approximately 6.5 jobs annually over the 20 year period, whether the base case or high price fuel scenarios hold true. The 6 mill SBC, on the other hand, would lead to an average loss of 15.5 jobs annually over 20 years relative to the base case, or 12.2 jobs annually relative to the high fuel

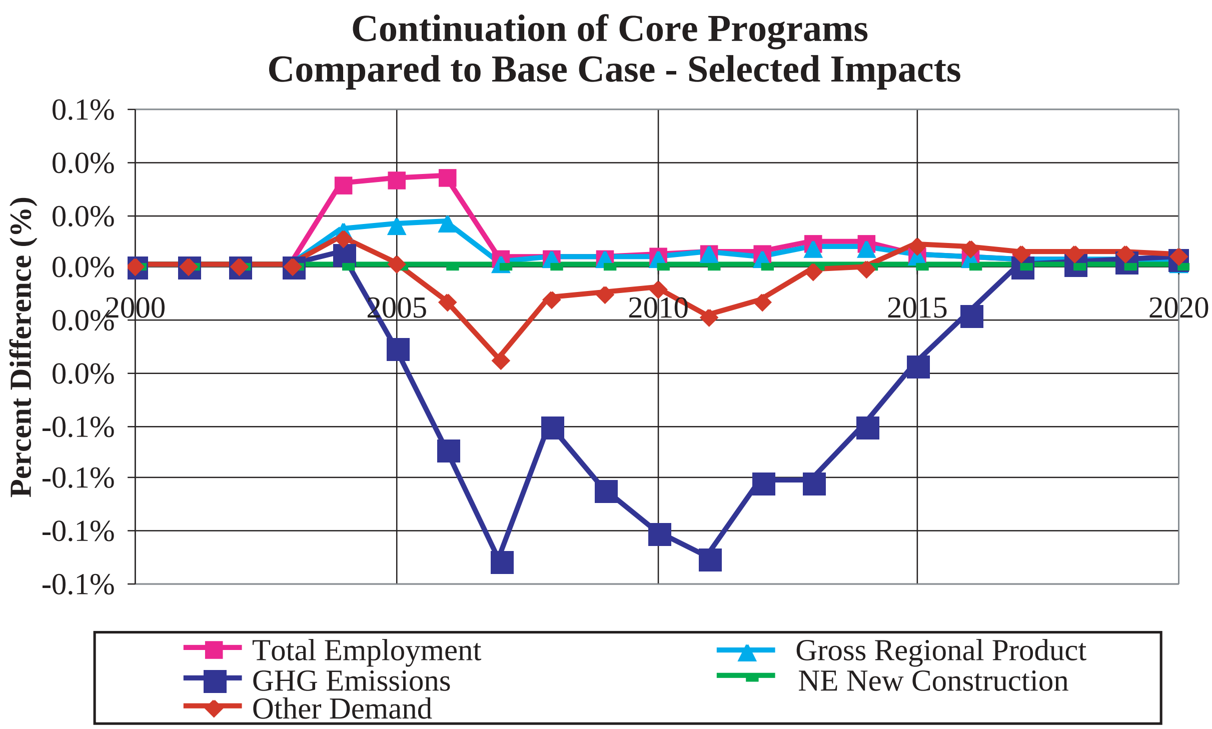

Figure 9.4. Impacts of the Core Program Continuation Relative to Base Case

price scenario. The main difference comes in the 6 mill SBC in the year 2020 for the Base Case fuel price scenario. In this case, the lower wholesale electricity price delays new construction of power plants to beyond the forecast horizon, so that the jobs associated with plant construction are also delayed beyond the forecast horizon. Again, the benefits to the economy of the SBC-funded efficiency programs are significant, and are not captured here.

Table 9.1. Employment Impacts of 3 mill SBC

Total Employment (Thousands)	2000	2005	2010	2015	2020	20-Year Average
Base Case Comparison						
Base Case	699.797	741.202	777.134	813.023	842.421	**779.501**
EE SBC 6	699.797	740.878	776.845	812.804	840.504	**779.191**
Difference	0.000	-0.324	-0.289	-0.219	-1.917	**-0.310**
Percent Change	0.00%	-0.04%	-0.04%	-0.03%	-0.23%	**-0.04%**
High Price Scenario Comparison						
High Price	699.797	741.202	773.287	806.896	846.290	**776.937**
EE SBC 6 HP	699.797	740.878	773.041	806.709	845.447	**776.692**
Difference	0.000	-0.324	-0.246	-0.187	-0.843	**-0.244**
Percent Change	0.00%	-0.04%	-0.03%	-0.02%	-0.10%	**-0.03%**

Table 9.2. Employment Impacts of 6 mill SBC

Total Employment (Thousands)	2000	2005	2010	2015	2020	20-Year Average
Base Case Comparison						
Base Case	699.797	741.202	777.134	813.023	842.421	**779.501**
EE SBC 3	699.797	741.043	776.986	812.902	842.005	**779.373**
Difference	0.000	-0.159	-0.148	-0.121	-0.416	**-0.128**
Percent Change	0.00%	-0.02%	-0.02%	-0.01%	-0.05%	**-0.02%**
High Price Scenario Comparison						
High Price	699.797	741.202	773.287	806.896	846.290	**776.937**
EE SBC 3 HP	699.797	741.043	773.164	806.778	845.717	**776.803**
Difference	0.000	-0.159	-0.123	-0.118	-0.573	**-0.134**
Percent Change	0.00%	-0.02%	-0.02%	-0.01%	-0.07%	**-0.02%**

9.3.2 Continuation of Core Energy Efficiency Programs

The current electric energy efficiency "core" programs administered by the electric utilities have been approved by the Public Utilities Commission through December 31, 2003 (a total of 19 months). The total program costs are just over $25 million, and will be used to perform audits, provide technical assistance, and install electric efficiency measures that together are projected to save over 820 GWh of electricity over the lifetimes of the measures. The programs are funded by a system benefits charge (SBC) supported by all ratepayers.

Figure 9.4 makes clear the dynamics of the economic impacts of the Core program extension, which tells an interesting story. From 2004 through 2006 we see the direct and indirect effects of the energy conservation measure installation activity. These effects more than offset reductions in economic activity tied to the 1.6% SBC increase in electricity costs. Then, from 2007 through 2020, the state's economy reaps the benefits of these 3 years of energy efficiency gains in two main ways. First, the state's businesses are more efficient and therefore more profitable and competitive than in the Base Case.

Secondly, the state's residents have higher disposable income due to the residential energy savings, and so they are able to spend more money in the state economy. Note that in every year we see positive economic impacts of the core program extension. It is only as the energy efficiency measures retire after 2015 that the economic advantages of energy efficiency begin to subside back towards parity with the Base Case. Table 9.3 summarizes the employment impacts in absolute terms at five year intervals. This table also shows that the benefits of core program extension are expected in the context of the high fossil fuel price scenario as well as the base fuel price scenario.

Table 9.3 Employment Impacts of Core Program Extension

Total Employment (Thousands)						
	2000	**2005**	**2010**	**2015**	**2020**	**20-Year Average**
Base Case Comparison						
Base Case	699.797	741.202	777.134	813.023	842.421	**779.501**
Core Cont	699.797	741.445	777.164	813.060	842.439	**779.560**
Difference	0.000	0.243	0.030	0.037	0.018	**0.059**
Percent Change	0.00%	0.03%	0.00%	0.00%	0.00%	**0.01%**
High Price Scenario Comparison						
High Price	699.797	741.202	773.287	806.896	846.290	**776.937**
Core Cont HP	699.797	741.445	773.305	806.929	846.311	**776.990**
Difference	0.000	0.243	0.018	0.033	0.021	**0.053**
Percent Change	0.00%	0.03%	0.00%	0.00%	0.00%	**0.01%**

In this policy simulation we considered the potential effects of extending both the core programs and the SBC that currently funds them. We tested a 3-year extension of the core programs funded by a 3-year SBC at an average rate of 1.543 mils. We assumed a 10-year lifetime for all measures, and distributed the measures across end-uses and sectors in a fashion that matched the sector and end-use breakdown of the original core programs. Measure installation is distributed evenly across the 3 years of the program.

The impacts of the core program extension relative to the Base Case are illustrated in Figure 9.3. This figure shows that the initial three year SBC raises retail electricity prices by approximately 1.6%. However, we also see more than a 1% reduction in electricity demand, which lasts for ten years, after which time the measures begin to retire. As a result, the reduction in electricity demand brings the benefit of reduced electricity prices even after the SBC expires. In addition to the impacts on electricity prices and generation, and on the demand for electricity and for natural gas, the remaining effects (such as employment, gross regional product, and greenhouse gas emissions) of the core program extension are smaller in percentage terms than a tenth of a percent; therefore, we display the response of just these other variables in a separate graph, Figure 9.4.

In conclusion, operating cost-effective energy efficiency programs provides significant lasting benefits to New Hampshire's energy security, reliability, and economy, and environmental improvements for the state's residents and businesses. The economic benefits start immediately, as New Hampshire businesses ramp up to deliver efficiency programs, and last for the lifetimes of the measures. These measures also reduce the risk to residents and businesses posed by the possibility of a fuel price shock.

9.4 The Role of Energy Codes

9.4.1 New Hampshire's Energy Codes

Energy Codes in New Hampshire have existed since 1979, with several updates occurring since then. In February of 1999, the state mandated adoption of the national standard "Model Energy Code – 1995" as New Hampshire's Residential/Small Commercial Energy Code. Similarly, for construction projects that are equal to or greater than 4,000 square feet, the Public Utilities Commission and the NH legislature adopted the national standard "ASHRAE/IES [American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. & the Illuminating Engineering Society of North America] Standard 90.1-1989" in July of 1993.

Legislation passed in March 2002 by the New Hampshire Legislature (House Bill 285) unifies all building codes into one family of codes established by the International Code Council, which developed the "International Energy Conservation Code 2000" (IECC 2000) as its energy component. This new standard will apply to all new construction, with specific chapters outlining requirements for the residential and the commercial / industrial sectors. Under the provisions of HB 285, enforcement of the energy code remains a responsibility of the individual municipalities where building code officials exist and is to be fully implemented by September of 2003, 18 months after enactment. In municipalities without building code officials, residential contractors are required to send their permits to the Public Utilities Commission for approval. For commercial and industrial construction, an architect's signature stating that a building meets the energy code requirements is mandated.

There is some discussion that the Codes Review Board may change the energy code section to reference “ASHRAE 90.1 – 1999” instead of the existing standard. This newer energy code provides more stringent requirements for the building envelope, providing for greater energy efficiency. This simple reference to the updated code will achieve much larger energy savings than the current language, which incorporates the 1989 version of “ASHRAE 90.1.” By establishing rules that reference the updated ASHRAE code, New Hampshire will establish compliance with a recent U.S. Department of Energy (DOE) ruling that requires states to adopt “ASHRAE 90.1 – 1999” or a comparable code by 2004. Failure to implement a stricter code would put New Hampshire in jeopardy of losing DOE funding for energy code related projects.

Compliance with Building Codes

In 2000, the Northeast Energy Efficiency Partnerships, Inc. (NEEP), conducted a study for the Governor’s Office of Energy & Community Services and the Public Utilities Commission to gauge local building code officials’ knowledge of the residential and commercial and industrial energy codes and assess efforts undertaken by code officials to determine compliance. The study revealed that 136 of New Hampshire’s 234 towns and cities, or 59%, have local building officials responsible for compliance with the energy code. Of the 91 New Hampshire officials surveyed, 39% identified themselves as “part-time officials.” Part-time officials generally believe they are less knowledgeable than their full-time counterparts. They said they find fewer and less severe barriers to compliance, have held their positions a shorter amount of time, are less likely to consult state officials for assistance, and are significantly less likely to attend additional trainings than full-time code officials. When asked to indicate “substantial barriers” in residential code compliance, a number of officials identified two major barriers: the complexity of residential codes and a lack of resources for compliance; and the increased workload for towns to ensure compliance.

Energy codes produce few benefits if they are not being enforced in the field. Except in 25 larger communities clustered in the more urban, southern part of the state, local code officers – if they exist at all – tend to be part-time officials who have significant demands placed on their time and resources to regulate construction for the basic elements of health and fire safety, let alone energy efficiency. Local code officials often must balance their time inspecting construction with other town responsibilities. These officials, even in the state’s larger communities, have sometimes viewed energy codes as too complex and time consuming to enforce, particularly given the demands on their time to simply keep up with “core” health and safety compliance. As a result, energy code compliance in New Hampshire tends to be a lower priority in some municipalities.

9.5 Energy Efficiency Recommendations

The energy efficiency programs funded by the Systems Benefit Charge (SBC) provide significant and ongoing energy, economic, and environmental benefits to the state. Investments in energy efficiency help reduce overall generation and associated emissions, reduce the state's reliance on imported fuel, reduce long-term electricity prices, and buffer the state from the effects of a fuel "price shock." The SBC is necessary to fund energy efficiency programs, and it fairly allocates expenses to ratepayers based upon energy use.

However, in order to assure cost-effective use of money generated through the SBC, the state, utilities, consumers and other stakeholders should regularly evaluate the programs funded to ensure that they provide the necessary services to customers, as required by RSA 374-F:4, VIII. While there may be ways to more efficiently deliver energy efficiency programs through a change in programmatic offerings or program administrators, continuation of the SBC to fund energy efficiency is a wise investment, and should be continued in the future.

Building Codes Recommendations

As the State Building Codes Review Board moves forward, serious consideration should be given to adopting ASHRAE 90.1 – 1999 as the referenced energy code for commercial and industrial buildings. This change would improve energy efficiency in new commercial and industrial construction, bring New Hampshire into compliance with pending changes to federal Department of Energy rules, and improve code enforcement due to clearer language in the new standard.

The State should also continue to pursue ways to help municipalities understand, value and enforce energy codes as part of building codes. Great strides are being made through training offered by the Governor's Office of Energy & Community Services and the Public Utilities Commission statewide, which provide code officials an opportunity to learn about and discuss the energy code.